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OUR IGNORANCE CONCERNING INSECTS

BY FRANK E. LUTZ,

Curator of Insect Life, American Museum of Natural History, New York, N. Y.

(continued from page 29)

We shall return later to the pessimism expressed in the last sentence of that quotation from Maeterlink, a pessimism which seems to have caught the popular fancy, but let us first consider some of the rather startling things that have recently been discovered about the biology of that group of animals that make up three-fourths of the animal kingdom even though they are usually not represented in zoological gardens, are the Cinderellas of most zoological museums, and are a part of the great unknown to most university professors of zoology.

Mr. Alfred L. Loomis is a business man whose hobby is physics, just as other men's hobbies are buying butterflies, shooting animals, sailing boats or collecting golf scores. He has a private physics laboratory full of up-to-the-minute apparatus. It was my privilege to be a guest at this laboratory even though I am not a physicist. While there I could try almost any fool thing that came into my unpractical mind; and that is my hobby.

Physiologists at Harvard and elsewhere had been publishing accounts of the way various animal and plant reactions speeded up with an increase in temperature. An astronomer had spent daylight hours, when he could not see stars, in timing the speeds at which ants went about their seemingly endless activities. That seemed impractical enough for a pure-science zoologist vacationing in a physics laboratory but we wanted to vary environmental factors as we pleased and that is a difficult thing to do on the side of a garden wall or on a path through the woods. We wanted our insects to walk in a bell-jar or something of the sort but we wanted them to walk and keep on walking in a straight line until either they or we got tired. We recalled the wheel in an old-fashioned squirrel cage. Then followed weeks and even months of making wheels weighing less and less in an attempt to get one light enough for a small insect to turn. It was great fun and finally we succeeded, not by making the celluloid wheel abnormally light but by using a steel hat-pin for its axle and just about floating it in air by placing each end of the axle below a small electromagnet. While we sat in comfortable chairs we could watch an insect walk, and walk at whatever was the correct speed but not get anywhere. We even put a recording device on the wheel so that the contraption all but wrote up our notes.

The published chart [2] gives one of the results of our experiments with temperature and is quite in accord with the findings of the physiologists. The formula of the curve which fits the findings is a very complicated mathematical affair which, whether it means anything or not, is the same sort of formula as that which describes the speed of chemical reactions in relation to temperature.

2. "Experiments with 'Wonder Creatures';" Lutz, Frank E.; 1929; Natural History, Vol. XXIX.

A bell-jar of itself suggests experiments with low barometric pressures or partial vacuums. Furthermore, a strictly economic entomologist whose interest at that time was in high-flying insects and the drift of toy balloons paid us a short visit during the course of which he discussed the question as to how high insects fly and may then be carried in the upper-air currents even across international boundaries. We told him that we could not tell him how high insects do fly but it would be easy to find out how high they could go and still live. What was more, we thought that we could do it between luncheon and tea-time without leaving the laboratory.

There was more to it than we thought at the time but we put the wheel into the bell-jar, hooked the tubes as shown, and started the vacuum pump.

Now, the higher it is above sea-level the less air and, therefore, the less barometric pressure there is. The barometer merely measures the rarity of the air and, hence, in mountain climbs or balloon rides or airplane flights it measures the height above sea-level. The insect which we used in our first complete experiment was not, strictly speaking, an insect at all but *Spriobolus,* a so-called thousand-legger.

This chart [2] shows many things. In the first place it gives the curve of the relationship between barometric pressure and height above sea-level. In the second place it shows what a puny creature the self-styled Lord of the Earth really is. You see the relative heights of some of the mountains on this world which he vainly says is his. The air is too rare on their tops for man to crawl, much less to run, even with specially created breathing devices; yet I venture to say that, if there were anything on those mountain-tops for a respectable insect to eat, the insects would be there eating. You see indicated on the chart the highest point ever reached by a living man sitting absolutely still in the basket of a balloon furnished with the best apparatus yet invented for keeping him alive and that man may not have been living when he reached that point, for he was dead when the balloon came down.

You can also see what the lowly "thousand-legged" relative of insects did in these reduced atmospheric pressures. It made its best speed at a point where man could make none. Possibly it was trying to get quickly into more normal conditions.

When Man wished to get to the top of Mt. Everest he first practised living at moderately high altitudes, then he moved up a bit and lived a while there, and so on in an effort to accustom himself to the really relatively slight decreases in atmospheric pressure which he hoped to survive. Even relatively slight changes, if sudden, lay him out. So, one afternoon I put some frail vinegar flies to a test in sudden changes.

Ten of these flies were put into a bell-jar together with a dish of water to keep them from drying up in the vacuums they were about to encounter, and the air, as such, was completely pumped out. The barometer showed a pressure of about 22 mm. but it was the water-vapor that was keeping it there. This pressure represented a height of more than seventeen miles above sea-level and the flies were taken there from approximate sea-level in ninety seconds. The flies stopped moving, possibly because they were chilled by the excessive evaporation from their bodies.

Then the valves in the apparatus were opened wide and the prssure almost instantly returned to normal. Within four minutes all ten were walking about as thought nothing had happened. The same procedure was repeated again and again. After the eighth trip from a pressure of that at approximate sea-level to one of that more than seventeen miles up in a minute and a half, and return trips in less time than it takes to say it, one fly did not walk within seven minutes after reaching ground pressure and I did not wait for him but went on with the one- to three-minute swings from normal pressures to practically no air and back again. After the twentieth trial only six of the ten stalwarts were walking and I took time out for tea.

After tea we (the flies and I!) made four more round trips and then only a male and a female of the original ten were still alive. There seemed no point in pushing the experiment to their death and, besides, I wanted to see if they were really as well and hearty as they seemed to be. So I put them in a cage with a nice ripe banana, where they started breeding the next day. Careful microscopic examination of their children, grandchildren, and great-grandchildren failed to reveal indications that anything unusual in fruit-fly affairs had happened.

Human endurance would fall so far below that of insects in such a test that no comparison can be made. An express elevator in the Empire State Building or the dropping of a cage in a deep mine are slow coaches going a short block compared to the ride these flies took twenty-four times in four hours, but in what follows we tried to reach the limit of even insect endurance —and failed as far as air-pressure is concerned.

It is well known that, in order to produce X-rays, the air is almost completely removed from the X-ray tube and then an electric discharge of very high voltage is made to jump the gap between two electrodes in this "vacuum". But the so-called vacuum, while nearly complete, is not entirely so; there are still enough ions left to carry the electricity from one electrode to the other. Furthermore, it is possible, by means of a pump which Mr. Loomis has in his laboratory, to exhaust the tube so completely that the X-ray dies out and even 30,000 volts will not force a discharge across the gap. Instead of an air-pressure of about 760 mm. of mercury, as we have in normal atmosphere at sea level, the pressure now in the tube is of the order of one ten-thousandth of one millimeter. It is probably lower than the vacuum of interstellar space. What would happen to a "frail" butterfly or bee if subjected to such a vacuum and then suddenly brought back to normal pressures?

The answer is complicated by a factor already mentioned, one which we found was more important than sudden and great changes in air pressure. This factor is that the pump which removes the air also removes the moisture; and insects which are kept in a pressure much less than the vapor pressure of water would quickly dry up and die of desiccation. Water cannot be supplied to them in this apparatus, because some of it would evaporate so quickly that what remains would be frozen to solid ice and, in fact, part of the slowing effect of high vacuum on insects may be due to a marked lowering of their temperature caused by evaporation from their bodies. However, let us see what happened.

Three small bees belonging to two genera of the sort that live a solitary life, instead of in colonies, two mound-building ants, a beetle related to fire-flies, and an immature grasshopper were put in a tube and the ends of the tube were melted so that it was welded into the apparatus. (Ordinary joints would not hold.) Since moisture would ruin the pump and since the moisture was sure to come from the insects, that part of the tube between the insects and the pump was packed in a mixture of solid carbon dioxide and acetone in order to freeze the water out of the air on its way to the pump.

The pump was started and the next three minutes were busy ones. First the vacuum-tube glow appeared, but before the end of the second minute it had died out, showing that a non-conducting vacuum had been reached. This was held for 60 seconds, a rapidly growing pile of snow in the chilled connection being the moisture sucked out of these "frail" creatures, and then the glass tube was broken at one blow and the insects were returned to normal conditions from their journey into a "complete vacuum." Not one moved then but two hours later all were active and apparently normal. A little later one of the ants showed some signs of trouble but whether it was due to the vacuum, the drying, or to some more natural cause I do not know. The next day that ant was dead, but when released, the other ant and all of its companions each according to its kind flew, hopped, or walked away.

The same experiment was tried with a bumble-bee and two kinds of butterflies, except that the insects were in a vacuum of less than one millimeter pressure for four minutes and the extreme of 1/10,000 mm. was kept up for 90 seconds. In about ten minutes after the tube was broken, instantaneously returning them to normal pressures, the bee and one of the butterflies began to show signs of life. Five minutes later both were walking and the other butterfly was feebly moving its legs and mouth-parts. By the next day the bumble-bee was as active as ever but the butterflies had died. Possibly they were unable to withstand the conditions of the experiment, including the excessive drying, and possibly they died from other, more natural causes, but it did not seem necessary to try the experiment again. There was no longer room for doubt that insects and their near relatives are creatures that can not only exercise vigorously at air-pressures which no man nor any of the animals related to him could survive; creatures that can not only completely recover within a few minutes from sudden and rapidly repeated transfers from normal pressures to almost none and back again; but they are creatures that can survive the most complete vacuum that man can produce with exceptionally perfect apparatus. How do they do it; why can they do it?

All that we can say is that insects seem to be better made than we are. Possibly Maeterlink was right when he called them "beings so incomparably better armed and endowed than ourselves, concentrations of energy and activity in which we divine our most mysterious foes, the rivals of our last hours, and perhaps our successors." On the other hand, as has been pointed out, relatively few kinds of insects seriously injure us and we owe much to many kinds. Possibly, with increased knowledge of insect habits, we may be able to swing the balance still more in our favor.

What good are such experiments as these? Possibly collecting interesting information about the masterpieces of Creation is of no greater value than collecting human masterpieces of art; but, until some one is wise enough to be able to predict the worth of any bit of "pure" (as contrasted with "applied") science, we can at least say that it is interesting.

Would the zoologists whose zoology does not reach any farther than half the length of one arm have even guessed that such a thing was possible? Not at all. It is not contained in their philosophy of guinea-pigs and sea-urchins.

There is another story which contains a sad joke on those who, knowing the biology of mammals, thought that all the rest of the animal kingdom must be like mammals, only less so.

For years careful students brought up in the one hand and a fore-arm kind of discipline had observed the visits of insects to flowers. More than three thousand papers were written on the subject and countless tables were made to show the relation between the visits of insects and the colors of the flowers. Weighty philosophical conclusions were drawn but these impressive tables bearing their philosophical burdens rested on the planks that the colors of the flowers are only what we see and that insects see from red to violet, no more, no less.

Then trouble started in Germany. One man, Hess, said that insects are completely color-blind. This would never do. So another German with careful and ingenious experiments on the ordinary and much studied but not yet fully understood honey-bee showed that the first German was partly wrong. This second German, von Frisch, trained bees to come to the honey in a dish placed on, say, a blue plaque. After they were trained a blue plaque without honey was placed among a lot of plaques of different colors and also without honey. The trained bees passed up the other colors and flocked to the blue plaque hunting for honey that wasn't there. Clearly bees can distinguish blue from other colors.

However, when bees were trained to get honey from a red plaque and then tested, it was found that they could not distinguished between red and gray. They are color-blind to red. They were found to be color-blind to other long-wave colors also and things looked bad for those conclusions resting merely on a knowledge of mammalian powers of color-vision. But the trouble was not over. A scrap of paper had been prepared in England.

One date that I can remember for a reason which need not be told here is 1879. In that year Sir John Lubbock wrote about his experiments in which he scattered ants and their pupae in a trough-like cage which he lighted with a spectrum from a quartz prism. One end of the trough was bright red and successively there was orange, yellow, green, blue, violet and ultraviolet. Only, since man can not see ultraviolet, that end of the trough looked dark to Sir John and to any other man who saw it. The ants, however, strongly desirous of getting their pupae into the darkest spot they could find, first hustled them out of the to-man dark ultraviolet end of the trough just as though that were the brightly lighted end. That was that—an interesting observation in pure science which did not seem to have much bearing on other things.

The United States of America got into the trouble rather late and, of

course, by means of a commission. Its National Research Council appointed a committee. This committee soon found that all of the flower-visiting insects acted toward ultra-violet the way Sir John's ants did in 1879.[3] In fact, we now know that they see ultraviolet as a color just as they see blue as a color and not merely a gray of some shade. There went one of the planks prepared by zoologists who had neglected three-fourths of the zoological world but their tables might still stand, a bit wobbly, on the other plank if there are no ultraviolet flowers.

The National Research Council's committee contained a physicist, Professor Richtmyer of Cornell, who most kindly interrupted his own researches to help out with this problem. Here are some of the flowers he studied and his corresponding spectrographic curves. Those who understand such graphs will see that there are flowers which are ultraviolet and flowers which are not ultraviolet just as there are flowers which are red and flowers which are not red. Furthermore, there are flowers having an ultraviolet pattern. Since I am not a physicist I took the following pictures to help myself and those of my biological friends who are not physicists to understand this thing. They were taken through a screen that passed ultraviolet light but none of the spectrum that we can see. Therefore they are uncolored photographs of what insects see.

Here are three Portulacas. To humans the flower on the left is red, the middle one yellow, and the one on the right pink. To insects they are all bright ultraviolet.

These are three Zinnias which, humanly speaking, are colored like the Portulacas just shown but to insects they are mighty dull flowers—no ultraviolet and, of course, our red, yellow and pink colors mean little to insects.

These are the to-us plain yellow Black-eyed Susans. To insects the tips of the petals are bright ultraviolet, the bases of the petals dark gray or black.

Do not ask me what ultraviolet looks like to insects. I do not know; but I do know that volumes of papers on the relation between floral colors and the visits of insects must be rewritten all because the authors of the original ones were or trusted zoologists largely absorbed in a mere hand-length of the zoological world.

Is it any wonder that there is an insect menace? But what about it? As Eddie Cantor said, "the country faces a crisis and the question is what is the answer." It seems to me that we might expect nothing else but a crisis and that we deserve nothing better than our present condition when we furnish our economic entomologists with so little pure-science research concerning the group which we expect them to control for our protection. In some cases tax-supported entomologists are forbidden to do anything, at least in working hours, that they can not make their superior officers believe is going to lead directly to some PRACTICAL—written in State capitals—some practical result. I have heard of one government office that discourages its entomologists from doing general field work in even their own time.

3. "Apparently Non-selective Characters and Combinations of Characters, including a Study of Ultraviolet in Relation to the Flower-visiting Habits of Insects"; Lutz, Frank E.; 1924; Annals of the N. Y. Acad. of Sciences, Vol. XXIX.

Such a policy is deadly and can be excused only on the theory that these workers are nothing else than either common laborers or police officers, not scientists. Common laborers can and did string the wires that bring in the electricity that lights this building but electric lights were made possible by those impractical souls who burned candles, kerosene or gas while they experimented with the to them merely interesting phases of mysterious physical phenomena.

Today the strictly commercial National Electric Lamp Association maintains for truly practical purposes the Nela Laboratories near Cleveland but it is not so short-sighted as to discourage research in pure science; and pure science is paying the Association handsome profits.

Returning to economic entomology, we still have the comment given in the words of Eddie Cantor, a singing clown of Hollywood: "We are facing a crisis and the question is what is the answer."

Let us ourselves be practical. Police duty in guarding us against undesirable humans is one of the recognized functions of a government and pure-science studies of psychology and sociology do not seem to be. Much the same is true with respect to guarding us against undesirable insects. Our governments may be short-sighted but in this problem we are confronting a condition and not a theory of government. Individuals and private institutions are much more open-minded and nimble-witted than tax-supported political bureaus. We probably can not change the way governments work, even if we would, but let us come out of our chitinous shells and show our zoological friends in the laboratories of endowed universities what they are missing if they neglect three-fourths of their subject. From such scholastic centers, in spite of—or possibly because of—much time taken by students and similar duties, there have come many of the advances in pure science which medicine and industry have applied to practical purposes and from such centers might well come something more useful to applied entomology than poisons and crop rotation.

But there is still more to hope and to work for. A professor in even an endowed university is apt to be distracted by many things quite foreign to research, not the least of such distractions being the urge to be popular and to turn out a large number of graduates, Ph.D's preferred, even though the majority of these students never ought to have been admitted to graduate courses in entomology and the minority who are worthy of admission ought to have been kept there until they had learned more science than a smattering of insect taxonomy and the anatomy of a starfish.

What we need and what is bound to come are privately endowed laboratories for unhampered research concerning insect biology. Research unhampered by orders from above to be either "practical" or popular.

We already have a laboratory most lavishly, perhaps too lavishly, endowed for plant research. My first job after getting one of those half-finished doctorate gowns was in a purely research laboratory of experimental evolution. An American oceanographic institute is the latest of these specialized research stations. Where is there a laboratory for the study of the biology of the group which comprises three-fourths of the entire animal kingdom, a group whose biology is so different from that of other animals that it can not safely be in-

ferred from researches in other fields, a group "so incomparably better armed and endowed than ourselves, concentrations of energy and activity in which we divine our most mysterious foes, the rivals of our last hours, and perhaps our successors" unless we take time to get acquainted with and to learn how to make use of our insect friends, more numerous than our insect foes, unless some of our colleagues can get away from the pressure of trying to save particular crops in a particular tax-district and can get down to the fundamentals of the subject? Only so can we expect to discover things that are fundamentally new, methods of control that are more than modern adaptations of methods which were known before most of us were born.

Such laboratories will not only be something new in science. They will be our real protection against the "insect menace" which is great only because of our ignorance. The need is real and I have faith founded on experience that our men of wealth will meet the need. Who may be the first to combine the vision with the financial ability to make the dream come true I do not, of course, know. But I thoroughly believe that only in this way and not through governmental offices lies the path out of our menacing ignorance concerning insects.

(to be continued)

NEW COLEOPTERA XV.

BY H. C. FALL,
Tingsboro, Mass.

Pinophilus confusus n. sp.

Moderately slender, parallel, black, the apices of the last two ventral segments narrowly nebulously paler; legs pale testaceous; surface shining, the abdomen rather less so, pubescence somewhat obscure in color.

Head with a few coarse punctures mostly postero-laterally, with much finer ones sparsely dispersed. Eyes not quite attaining the basal margin of the head. Antennae of the usual type, outer joints decreasing in length but all perceptibly longer than wide.

Prothorax a little wider than the head, slightly longer than wide, sides nearly straight and perceptibly convergent behind, punctuation rather coarse, not dense, the interspaces polished and with a few minute punctures, median smooth line indistinct.

Elytra slightly longer but not wider than the prothorax, a little longer than wide, coarsely, deeply and closely punctate.

Abdomen finely and less densely punctate, a little less shining but not visibly alutaceous.

Length 8 to 8.5 mm.; width 1.4 mm.

Described from two examples bearing label "Cape Hatteras, North Carolina, Jan. 1903; F. Sherman Collector". Both are probably females.

With the above I have associated a male from Dunedin, Florida, IV-4-23, and a female from Paradise Key, Florida, IV-4-25, both collected by myself.

These Florida specimens scarcely differ from the North Carolina types except in the just perceptibly shorter elytra, and there can be hardly a doubt that they are specifically the same. In the Dunedin male the sixth ventral is rather narrowly rounded (not at all truncate or emarginate) at apex.

The probability is strong that this is the species which Casey* for some unexplainable reason interpreted as LeConte's *opacus*. His description in every respect fits the present species except that his species is said to have a distinct smooth median line on the prothorax and his measurements indicate an unusually slender example. The true *opacus* of LeConte he has redescribed on the same page under the name *parvipennis*.

Pinophilus gracilis n. sp.

Very slender; black or piceous, extreme apex of elytra rufous, legs yellow. Antennae pale at base, outer joints progressively more infuscate apically, the last three or four globose-oval, not or scarcely longer than wide.

Head with a few coarse punctures on the front, near the eyes, and posteriorly; eyes virtually attaining the basal margin.

Prothorax very slightly longer than wide, just perceptibly wider at apex than the head, sides very feebly convergent and nearly straight; coarsely, numerously but loosely subevenly punctate, surface polished without intermixed finer punctures, dorsal smooth line ill defined.

Elytra distinctly longer than wide and perceptibly both longer and wider than the prothorax; punctures coarse, deep and close set but not in contact; interspaces shining.

Abdomen more finely, less densely, evenly punctured; sixth ventral of male truncate at apex.

Length 7 to 7.6 mm.; width 1.2 to 1.25 mm.

Tallulah, Louisiana; 2 ♂s, 1 ♀, submitted by Mr. C. A. Frost. The type is a male and bears date 7-23-30.

This is the smallest and most slender of our species of Pinophilus, and differs from all others in its slender, somewhat diffuse but quite evident rufous apex of the elytra.

Araeocrus elegans n. sp.

Moderately stout and convex, parallel, head and thorax polished black; elytra red, distinctly shining; abdomen black, sixth segment and fifth in apical two-fifths, rufous; lustre duller with trace of alutaceous sculpture; antennae, palpi and legs pale testaceous.

Antennae short, extending but little beyond the middle of the prothorax, joints 6-11 subequal and slightly longer than wide.

Head including mandibles about as long as wide; sides of front anteriorly with a longitudinally curved series of three coarse ocellate punctures, a few others along the margin of the eye and toward the sides of the base; surface throughout with very sparse minute feeble punctures. Eyes moderately convex, attaining the hind angles, tempora virtually wanting.

Prothorax not quite one-fourth wider than the head, length and width almost exactly equal, sides just perceptibly converging posteriorly, the hind angles more broadly rounded than the anterior ones; surface with a few coarse deep punctures arranged in two irregular dorsal series and a shorter oblique lateral one; scattered minute feebly impressed punctures are faintly visible as on the head.

Elytra about one-sixth longer than wide, evidently longer but scarcely

*Memoirs on the Coleoptera 1910, p. 196.

wider than the thorax, very coarsely deeply and closely punctate, the interspaces shining and not perceptibly punctulate.

Abdomen moderately finely punctate, surface finely alutaceous toward the sides and base.

Pubescence subrecumbent, very sparse on the elytra, more plentiful on the abdomen, yellowish brown or ferruginous in color except on the sides and lateral parts of the base of segments 1-5, where it is denser and fulvocinereous.

Length 8.75 mm.; width 1.7 mm.

Luling, Texas, July, 1893. A single example taken by the writer. It has the sixth ventral evenly rounded at the apex and is probably a female.

In the nearly forty years since the type was taken I have seen no other specimen of this very pretty species and know not if it is represented in any other collection. I find nothing like it in the Biologia.

Although this species is unquestionably a Pinophilinide, its reference to the genus *Araeocerus* is less certainly indicated. In *Pinophilus* the mandibular tooth is submedian in position and is long, parallel sided, the apex oblique and emarginate. In *Araeocerus,* says Casey, "the tooth is very small, simple and near the base". In the present species the mandibular tooth is rather large, acutely rectangular and subbasal. This structure favors *Areocerus,* and moreover the very sparse punctuation of the thorax is of the type shown in *picipes,* which according to Sharp is an *Araeocerus.*

Adelocera nobilis n. sp.

Of large size, dark brown, thinly clothed with intermixed reddish brown and pale yellow subsquamiform recumbent hairs which are nowhere at all condensed to form spots or fasciae; integuments moderately shining, not alutaceous.

Head slightly more than half as wide as the prothorax, clypeus concave, front with median impression.

Prothorax one-fifth longer on the median line than the width, sides parallel and feebly arcuate in middle half, broadly sinuate before the hind angles, which are acute and not or scarcely divergent; disk strongly convex, median channel obsolete or but feebly indicated, hind angles not distinctly carinate; punctuation coarse and close, the punctures separated by less than their own diameters but not in actual contact.

Elytra at base equal in width to the thorax, sides parallel and just perceptibly arcuate to middle, thence gradually narrowed to the rounded apex; punctures arranged in rows, moderately coarse at base but becoming gradually much finer apically where they are scarcely larger than the fine serial punctures of the nearly flat interspaces.

Body beneath similarly shining and with sparse subsquamiform hairs which are nearly all pale in color; prosternum coarsely punctate, the flanks more densely and almost equally coarsely so; ventral punctuation less coarse and somewhat sparser, the punctures of the terminal segment only very slightly closer and finer than those of the preceding segments; antennal grooves long; tarsal grooves of prothoracic flanks almost completely obsolete.

Length 18-22 mm.; width 4.9-5.3 mm.

Baboquivari Mts., Southern Arizona; 4 examples, collected by Poling. The type bears date 7,1-15, '24, sex unknown.

This is the largest species thus far made known from our fauna. The virtual absence of tarsal groves, the long antennal grooves and the strongly convex feebly channeled prothorax associate it with *avita* in Horn's table of 1879. The latter is at once separable however by the confused elytral punctuation. In one of the four examples of the present species there are vague indications of tarsal grooves. If with further material this should prove insignificant the species might be referred to Horn's second group where it would fall with *modesta,* in which however according to Candeze's description the condensation of the pubescence forms marbling on the thorax and oblique fasciae on the elytra as well as lateral abdominal spots, all of which are totally lacking in the present species.

Adelocera candida n. sp.

Of median size and narrow parallel form; moderately shining, not alutaceous, uniformly but rather thinly pubescent with a mixture of brown and yellowish gray short scarcely squamiform recurved hairs.

Front moderately concave. Prothorax very slightly wider than its length on the median line; sides moderately arcuate strongly sinuate at the hind angles which are acute and divergent though not prolonged; disk strongly convex, a feeble median channel, hind angles not carinate; punctuation rather fine and not dense, the punctures separated by about their own diameters on the disk, a little closer laterally.

Elytra barely visibly wider than the prothorax, sides nearly straight and parallel in basal two-thirds, disk lightly punctate, punctuation confused.

Prosternum rather coarsely punctured, the prothoracic flanks more finely and closely so; antennal grooves abbreviated behind, tarsal grooves not sharply defined, extending forward parallel with the antennal sulcus. Metasternum and ventral segments not very evenly punctured, surface quite strongly shining.

Length 11.3 mm.; width 2.9 mm.

Baboquivari Mts., Arizona; a single example collected by Poling, Sep. 15-30, 1923.

The tarsal grooves in this species are nearly as in *aurorata,* the antennal grooves however are more abbreviated posteriorly and at their extremity become confluent with the tarsal concavity. In *aurorata* and all other allied species the prothorax is less convex, the median sulcus deeper and the punctuation denser than in the present one.

I have not been able to identify either of the two species here described with any treated in the Biologia.

Adelocera mexicana Cand.

A Florida specimen in my collection without precise locality proves on comparison by Mr. Liebeck to be the same as two examples in the Horn collection identified by the Doctor as *mexicana.* My example agrees well with Candeze's description but not so closely with the short diagnosis and figure in the Biologia. Mr. Liebeck writes that he has seen another example collected by Mrs. Slosson in the Lake Worth region and two specimens taken by Mr. Blatchley at Royal Palm Park and sent me for examination prove to be the same thing. The species seems well established in the lower part of the peninsula and should be added to our list.

By Horn's table *mexicana* runs to *avita*, which differs at once by the confused punctuation of the elytra, *mexicana* having the punctures in rows. It is a large species, with a length ranging from 20 to 24 mm. according to Candeze. The Florida specimens are mostly smaller, my own example measuring 17 mm.

Scaptolenus socius n. sp.

Head fuscous; prothorax brown or yellowish brown, the thorax with a more or less obvious but diffuse median stripe and the hind angles fuscous, the elytra with the apex gradually a little infuscate. Terminal joint of maxillary palpi slightly shorter than the preceding. Antennae with joints 2-3 together equal to or slightly shorter than 4, the latter about twice as long as wide, the following joints less elongate. The lower edges of the joints are scarcely or not at all sinuate before the apical angles which therefore are not serriform.

Prothorax with sides strongly rounded anteriorly, becoming more nearly parallel than usual before the flare of the hind angles; surface rather closely finely punctate.

Elytra a little wider than the distance across the hind angles of the thorax, strongly gibbous at base and with the sides gradually convergent to apex as usual; disk regularly though not deeply sulcate and subcostate, the surface a little uneven near the apex; punctuation moderately coarse close and even throughout. The head, thorax and base of elytra are clothed with rather long erect fulvous hairs, the remaining surface of the elytra with short inclined brownish or fuscous hairs

Body beneath and legs yellow, the tibiae and tarsi a little more rufous; sterna and femora with rather dense long yellow hair; metasternum finely densely punctate and shining.

Length 12 to 13 mm.; width 5.25 to 5.5 mm.

Described from a series of eight specimens collected by Poling at Alpine, Texas, and one example from Culberson Co., Texas, submitted by Mr. W. Benedict. The type is from the first named locality and bears date July 1-15. All specimens are males.

As compared with the present species *lecontei* differs by the larger size, longer terminal joint of maxillary palpi, more oblique sides of thorax, deeper elytral sulcations, and a tendency for the summits of the elytral ridges to become narrowly smooth.

Ocreatus differs in its unique coloration—head, prothorax, body beneath, tibiae and tarsi fuscous; elytra testaceous with suture and margins fuscous, femora yellow.

Estriatus is unique among described species by the elytra showing almost no trace of sulci or costae.

In all three species (less noticeable in *estriatus*) the antennae are more or less serriform because of the flaring of the apical angles of joints 4-10; and in *lecontei* and *ocreatus* joints 2 and 3 are together shorter than joint 4.

Scaptolenus fuscipennis n. sp.

Rufotestaceous; head, and elytra except for a short distance at base, infuscate. Last joint of maxillary palpi subequal in length to the preceding. Antennae serriform, joints 2-3 together shorter than joint 4.

Prothorax strongly rounded in front, sides parallel before the hind angles almost to the middle.

Elytra shallowly striate sulcate, the interspaces broadly convex basally, becoming almost flat apically; punctuation finer than usual.

Body beneath, pubescence, and other features almost as in the preceding species.

Length 16 mm.; width 6.2 mm.

San Bernardino Ranch, Cochise Co., Arizona, 3750 ft., Aug. F. H. Snow.

The above brief diagnosis easily differentiates this species from all those mentioned above.

Drapetes cylindricus n. sp.

Elongate cylindrical, black, shining, upper surface wholly devoid of pubescence, elytra with a broad red transverse fascia before the middle after the manner of fully marked *D. geminatus*. The fascia may or may not attain the side margin; it is squarely transverse behind and bioblique in front, with a reentrant angle at the suture; it does not quite reach the summit of the humeral callus.

Head and elytra finely sparsely nearly evenly punctate, the elytral punctures showing some tendency toward a serial arrangement; thoracic punctuation slightly coarser but otherwise similar.

Prothorax as long as wide, equal in width to the elytra, sides in basal two-thirds straight and parallel and continuous with the sides of the elytra; surface evenly convex, lateral carina completely wanting, base feebly emarginate before the scutellum, hind angles produced and acute.

Elytra about 2¼ times as long as the thorax and fully twice as long as wide; sides straight and parallel in basal three-fifths, thence narrowed to the parabolically rounded apex; sutural stria very fine, abbreviated both before and behind; there is no lateral stria or carina.

Disk of prosternum each side with two fine parallel striae in the position of the usual carinae; at middle a few minute punctures; exterior to the striae some coarser setiferous punctures; propleura with similar setiferous punctures anteriorly, these becoming larger and variolate posteriorly. Metasternum and ventral segments minutely or finely punctate at middle, more numerously and coarsely so at sides; ventral segments and legs finely sparsely pubescent.

Length 4.25 to 4.85 mm.; width 1.3 to 1.7 mm.

Described from two examples sent by Mr. D. K. Duncan of Globe, Arizona. The type bears label Sierra Ancha Mts., Gila Co., Ariz., July, D. K. Duncan, Coll. The paratype is labeled Globe, Arizona, August, and is returned to Mr. Duncan.

This species must be associated with *ecarinatus* Schf. because of the absence of lateral pronotal carina, but differs from it and all our other species in its parallel sided or cylindrical form. In *ecarinatus* the sides of both thorax and elytra converge from their bases, giving a more oval form. *Ecarinatus* shows numerous other points of difference e.g. the red spot occupies the humeral angle of the elytra; the punctuation is coarser and closer, there is a submarginal elytra stria which is carinate at base, and the prosternum is bicarinate each side. Judging by the descriptions *cylindricus* cannot possibly be the same as any of the Mexican species.

Notoxus parvidens n. sp.

Rufotestaceous, elytra typically with a transverse median black fascia anteriorly angulate at the suture, a small basal spot each side of the suture, and the apex blackish. The median fascia may or may not reach the side margin, the basal spots are sometimes lacking and the apical dark shade may be entirely absent. When strongly defined it is often produced anteriorly along the side margins to or beyond the middle. Pubescence for the most part short and recumbent, but with a moderate number of semierect hairs on the elytra, mostly in basal half.

Antennae slender, fully as long as half of the body, scarcely incrassate apically, tenth joint less than one-half longer than wide; eyes a little longer than the oblique tempora.

Thoracic horn rather narrow in the male, somewhat stouter in the female, feebly dentellate at sides basally, crest with defined slightly crenulate margin.

Elytra about three-fourths wider than the thorax, moderately dilated submedially, apices rounded in the male, the sutural angles better defined in the female; punctuation very fine.

Abdomen darker than above especially apically, last ventral of male truncate and slightly arcuate, not impressed; in female more pointed with apex narrowly rounded. Anterior tibia of male with a very small tooth below the middle of the postero-interior margin.

Length 2.7 mm., width .9 mm.

Medicine Hat, Alberta (F. S. Carr); Delano Ranch, Platte Co., Wyoming, elevation 6800 ft. (C. A. Frost).

Described from a good series of specimens varying but little in size, most of which, including the type (♂, I-VII-29) have been sent me by Mr. Carr.

This little species is of the *monodon* type, the elytral fascia however being at the middle of the length rather than post-median as in *monodon*. It differs further from *monodon* and all other known species except *monticola, similis, calcaratus* and *intermedius* by the internally toothed protibia of the male. Of these four species *parvidens* is most nearly allied to *intermedius*, which is a much larger species with large triangular tibial tooth. In *parvidens* the tibial tooth is very small and easily overlooked.

NEW MICROLEPIDOPTERA FROM THE PACIFIC COAST; (GELECHIIDAE)

BY JOHN F. CLARKE,
Department of Zoology, State College of Washington

Aristotelia nigrobasiella sp. nov.

Antennae blackish brown annulated with white to grayish; markings in some specimens indistinct giving the antennae a light blackish brown appearance. Palpi, second joint blackish brown with the apex, a narrow strip and the base internally, white; terminal joint blackish brown with tip and base white scaled; face and head white with the tips of the scales light blackish brown. Patagia, base blackish brown, posterior part white mottled with blackish brown. Fore wing, ground color white; many of the scales tipped with blackish to light brown; at base on costa a blackish brown area; just before middle, on costa a large blackish brown triangular patch, the apex of which extends into the center of the wing; a few yellow ochre scales on the margins of the triangular patch. On costa beyond the triangular patch four indistinct blackish brown patches; exterior part of apical third heavily scaled with blackish brown; on outer third near center of wing a small distinct blackish brown spot; on dorsum before middle a blackish brown patch; from base to dorsum an oblique yellow ochre streak becoming broader as it approaches dorsum; from base an ill-defined yellow ochre line extending to the large triangular patch; a sprinkling of yellow ochre scales on apical third of wing; cilia pale smoke gray with a dark band just beyond base. Hind wings shining smoke gray, cilia somewhat lighter. Thorax and abdomen shining smoke gray; thorax with blackish brown and pale yellow ochre scales mixed. Legs blackish brown exteriorly and white internally; tarsi blackish brown, white annulated.

Male genitalia with short, broad bilobed uncus, strong hook-shaped gnathos; harps divided into an upper pointed and a lower rounded lobe; uncus curved, bulbous at base, pointed at apex; vinculum produced in narrow pointed anterior process. Eighth segment strongly modified as a cover for the genitalia, when at rest, with two elongate pouches, containing expansible hairtufts.

Female genitalia with lobes of ovipositor somewhat chitinized and facing each other so as to form a sharp edge for the inserting of the eggs; signum a five-pointed star.

Very similar in pattern and color to *Aristotelia isopelta* Meyrick (Exot. Micros. 3:482, 1929) but considerably larger. Like this species it has vein 6 of fore wing out of stalk of 7 and 8. Alar expanse—12-13.5 mm.

Distribution—Fraser Mills and Saanichton, British Columbia.

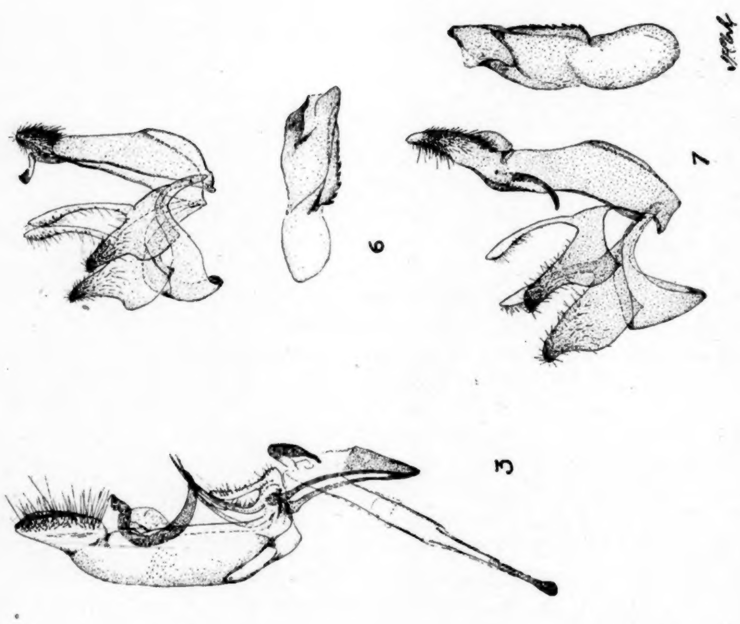
Type—In U. S. National Museum, No. 43449.

Type locality—Fraser Mills, British Columbia.

Described from male type and seventeen male and female paratypes from Fraser Mills (May 6, 1924, July 10, 1921, L. E. Marmont, collector), Saanichton (May 10-16, 1924, Blackmore), and (May 10-24, J. G. Colville, collector).

Paratypes in U. S. National, Canadian National, Provincial Museum, (Victoria), and author's collection.

 PLATE 2



Male genitalia of 1. *Gnorimoschema miscitatella;* 2. *Aristotelia nigrobasiella;* 3. *Gelechia seculaella;* 4. *Gelechia ornatifimbriella* Clemens; 5. *Gelechia aulaea;* 6. *Gelechia albifemorella;* 7. *Gelechia abactella.*

Gelechia albifemorella sp. nov.

Palpi, second pale ivory yellow, many scales above, fuscous; terminal joint mottled white and fuscous. Antennae fuscous black, faintly annulated with lighter shade. Head drab becoming lighter on top. Thorax light fuscous faintly marked with drab. Abdomen drab and fuscous, posterior margin of each segment buff. Fore wings, ground color light fuscous variously marked with fuscous, tawny and dirty white; at basal third, from costa a narrow outwardly oblique, transverse, fuscous dash reaching just beyond the edge of cell; on both sides of this dash a fuscous spot, the outer one diffusing toward costa; at apical third an inwardly oblique, irregular transverse fuscous patch extending well past center of wing, outside this patch an outwardly oblique transverse dirty white fascia; between the fuscous markings a dirty white color prevails; a few obscure longitudinal dashes tawny, fuscous markings faintly edged with tawny; apical third fuscous; cilia pale fuscous, narrowly banded basally with blackish-fuscous. Hind wings light fuscous; cilia pale fuscous. Legs, femora white, tibia white inwardly, fuscous outwardly; tarsi, fuscous, white tipped.

Male genitalia with uncus short, hood-like; gnathos weak, short, termination of posterior edge, three short teeth; harps bilobed, a slender upper portion and a broad, gently pointed lower part; vinculum without anterior process. Eighth segment modified to form an upper and lower cover for genitalia.

Female genitalia with signum a narrow chitinized plate with a strongly chitinized, short, toothed spine at each end. Alar expanse—20-24 mm.

Type—U. S. National Museum, No. 43517.

Type locality—Mt. Shasta (7,000 feet), California, (J. McDunnough).

Described from the male type, 8 ♂♂ and 2 ♀♀ paratypes all from the type locality, (16-VII). Paratypes in National Collection (5 ♂♂, 1 ♀), Canadian National Collection (1 ♂), and author's collection (2 ♂♂, 1 ♀).

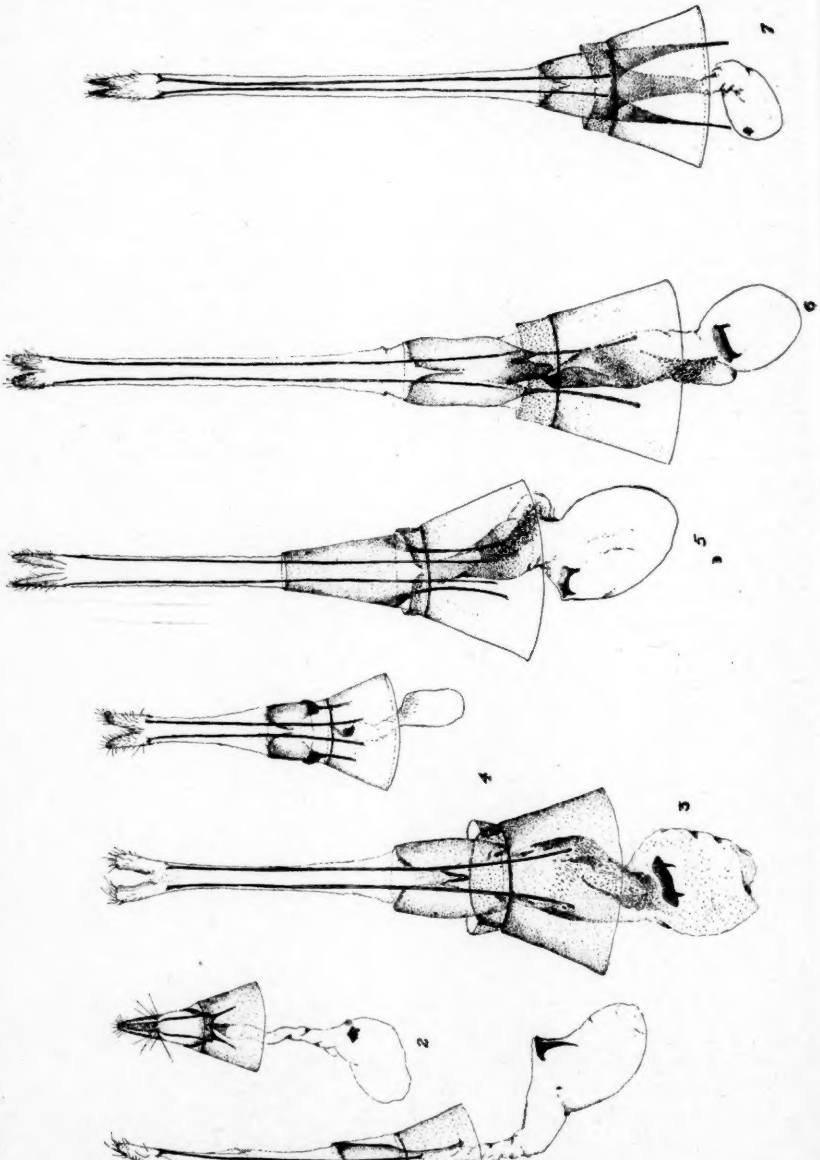
Gnorimoschema miscitatella sp. nov.

Palpi, pale olive buff interiorly; anterior part of second joint and terminal joint heavily scaled with blackish brown. Antennae blackish brown annulated with pale buff. Face, head and thorax pale olive buff mixed with light to blackish brown and pale ochraceous-tawny. Fore wings, ground color pale olive buff with ochraceous and blackish brown markings. The ochraceous markings are longitudinal, for the most part following the veins. At the posterior edge of cell one-third distance beyond base of wing a blackish brown spot, margined by buff and ochraceous scales; beyond this near center of wing two ill-defined blackish brown spots, somewhat larger. Hind wing smoky; cilia with a golden luster. Abdomen grayish to buff. Legs heavily mottled with pale olive buff and blackish brown; tarsi buff annulated.

Male genitalia with uncus broad bilobed, gnathos small weak, hook-like; harps divided in a long slender arm and a short pointed part. Vinculum with narrow triangular, pointed process anteriorly; uncus rather short straight with bulbous base. Eighth segment developed into an upper and lower cover for the genitalia.

Female genitalia with signum a single strong curved spine. Alar expanse 14-17 mm.

Type—In U. S. National Museum, No. 43450.



Female genitalia of 1. *Gnorimoschema miscitatella;* 2. *Aristotelia nigrobasiella;* 3. *Gelechia abactella;* 4. *Gelechia ornatifimbriella* Clemens; 5. *Gelechia albifemorella;* 6. *Gelechia aulaea;* 7. *Gelechia seculaella.*

Type locality—Wenatchee, Washington.

Described from male type, 7 ♂♂ paratypes, (Wenatchee, May to September, A. Spuler, collector), and one ♀ paratype, (Pullman, July 4, 1930, Clarke). Paratypes in U. S. National Museum, Canadian National Collection and author's collection.

This is closest to *Gnorimoschema tetradymiella* Busck, but is quite distinct.

The following three new species and *Gelechia ornatifimbriella* Clemens, (=*unctulella* Zeller), all belong to a group of closely similar species, difficult to separate with certainty except with well-preserved specimens, but easily distinguishable by the genitalia in both sexes. The specimens which are obscurely marked are especially difficult to separate. They all have a peculiar "curtain" scaling from the costa of the hind wings in the males, as is suggested by Clemens' name. For completeness' sake a description of Clemens' species is also included.

Gelechia ornatifimbriella Clemens

Palpi, shining fuscous black, dirty white interiorly. Antennae, fuscous black; head, face, thorax, and abdomen, deep mouse gray above sprinkled with fuscous black; on either side of face, a fuscous black line; thorax below silvery white; segments of abdomen irridescent, banded posteriorly with pale gray to cream color; anal tuft cream to light ochraceous-buff. Fore wing, ground color deep mouse gray sprinkled with fuscous black, two inwardly oblique blackish dashes, attenuated in middle, one at center of wing, one at basal third; cilia smoky. Hind wing and cilia shining smoky fuscous darker toward apex; on underside, in the male, from costa posteriorly a peculiar and characteristic curtain-like scaling. Legs shining fuscous black. Tarsi white annulated; posterior legs white interiorly, tibial hairs white.

Male genitalia with uncus narrow hood-shaped, gnathos weak hook-shaped; harp with a long slender upper branch and a broader lower part ending in a stout short hook. Vinculum broad, rounded, without anterior process. Uncus short stout, greatly involved, with a long narrow pointed process and another broadly rounded process. Eighth segment strongly modified into an upper narrower strongly haired part and a broad bilobed lower part, which cover the genitalia when at rest. Female genitalia with upper part of bursa copulatrix minutely spined. Alar expanse—17-22 mm.

Type locality—Texas. Food plant—Robinia.

Gelechia seculaella sp. nov.

Palpi, sooty black, sprinkled with white scales. Antennae, sooty black, with white pubescence; basal joint narrowly white tipped. Head and thorax blackish fuscous with gray and white intermixed. Abdomen, first four segments black; posterior part dark mouse gray. Fore wings, ground color dull blackish mouse gray becoming lighter toward apex At apical fourth a wide "V"-shaped patch heavily scaled with light umber and white mixed. Parallel to costa, at center of wing, in linear arrangement, three blackish fuscous spots; half way between inner spot and dorsum another elongate blackish fuscous spot. Hind wings smoky fuscous, lighter toward apex. Cilia smoky fuscous. Legs sooty black sprinkled with white scales; tarsi white annulated.

Male genitalia with uncus hood-shaped; gnathos a long slender curved hook; harps divided with upper arm a long, slender, curved chitinized hook, lower arm long and slender, dilated at apex and soft; vinculum with anterior pointed process; uncus very long slender, straight, apex bent over as a hook, opening for penis a long slit. Female genitalia with signum an irregular five-pointed star. Alar expanse—18-20 mm.

Type.—In U. S. National Museum, No. 43451.

Type locality—Pullman, Washington.

Described from the type and two male paratypes from Pullman (April 24, 1926, May 12 (2 ♂♂) 1930), all taken by the author. May 14, 1931, 4 ♂♂ and 1 ♀, collected in type locality.

Paratypes in U. S. National Museum and author's collection.

Gelechia aulaea sp. nov.

Palpi, second joint fuscous exteriorly mixed with numerous white scales; terminal joint fuscous black, posteriorly marked with buff. Antennae, shining fuscous black, terminal joint narrowly tipped with buff. Head and thorax, drab, scales tipped with fuscous. Fore wings, drab mixed with brown and buff, fuscous scales giving a mottled appearance, darker toward apex. At apical third an outwardly curved transverse buff fascia. In some specimens this fascia is almost completely obscured. Near outer end of cell a small blackish brown spot, two other similar spots near center of wing at either margin of cell; cilia buff to grayish. Hind wings light shining fuscous, darker toward margins, cilia somewhat lighter. Abdomen olive buff dorsally, whitish laterally. Legs shining fuscous black heavily scaled with white exteriorly, white interiorly; tibia white above, fuscous black beneath; tarsi fuscous black, buff tipped.

Male genitalia, uncus short, stout with a short stout hook at apex and a broad pointed process; gnathos a gently curved chitinized hook; harps, bilobed, with a long slender, dilated upper part, and a broad lower part ending in a stout short curved hook; viniculum rounded without anterior process. Eighth segment modified forming an upper and lower cover for genitalia.

Female genitalia with signum a broad chitinized plate with a short straight chitinized spine near either extremity. Alar expanse—18-24 mm.

Type—U. S. National Museum, No. 43452.

Type locality—Mt. Wilson, California.

Described from type male and 4 ♂♂ paratypes, Mt. Wilson, California, (3-VIII-24), 4 ♂♂ and 1 ♀ paratypes, Pasadena, California, (J. D. Gunder, collector) and 1 paratype, Mt. Lowe, California, (29-VII-24). Paratypes in National Collection, (5 ♂♂, 1 ♀), Canadian National Collection (1 ♂), author's collection (2 ♂♂, 1 ♀).

Gelechia abactella sp. nov.

Palpi, second joint, pale olive-buff interiorly, fuscous exteriorly; terminal joint fuscous black flecked with pale olive-buff scales. Antennae fuscous, faintly annulated with pale olive-buff; basal joint, pale olive-buff tipped. Head, face, pale olive-buff; dorsally drab, scales tipped with light fuscous. Thorax and fore wings drab. In some specimens the majority of scales are tipped with fuscous producing a somewhat darker appearance. On fore wings, at outer end of cell a small fuscous spot faintly margined with a pale yellowish olive-buff;

in basal third several small, scattered fuscous spots; on costa at apical fourth an obscure pale olive-buff spot; cilia drab. Hind wings, very light fuscous; cilia drab. Abdomen, segments pale olive-buff, anteriorly light grayish olive. Legs light fuscous exteriorly with numerous pale olive-buff scales; interiorly pale olive-buff; tarsi fuscous broadly tipped with pale olive-buff.

Male genitalia with uncus hood-shaped, narrow; gnathos a gently curved, weak hook; harps, divided, asymmetrical, with a long slender upper process, slightly dilated at distal extremity, and a lower broad bulbous process; vinculum without anterior process. Eighth segment greatly modified into a broad upper and a small lower, heavily ciliated process forming cover for genitalia when at rest. Female genitalia, signum narrow, with two short strongly chitinized spines. Alar expanse—19-22 mm.

Type—U. S. National Museum, No. 43518.

Type locality—Kaslo, British Columbia, (Cockle)

Described from male type, 5 ♂♂ and 9 ♀♀ paratypes all taken at the type locality. Paratypes in National Collection (4 ♂♂, 4 ♀♀), Canadian National (1 ♀), Provincial Museum, Victoria (1 ♀), and author's collection (2 ♂♂, 2 ♀♀).

The name *abactella* Mss. has been supplied several correspondents by the late William Kearfott and is here utilized to avoid confusion.

I wish to express my thanks to Mr. August Busck of the U. S. National Museum, who kindly consented to read over and correct the manuscript.

SOME ERYTHRONEURA (GRAPE LEAF HOPPERS) OF THE MACULATA GROUP. (HOMOPTERA CICADELLIDAE)

BY R. H. BEAMER,

Department of Zoology, State College of Washington

(continued from page 48)

51. **Erythroneura ungulata** n. sp.

General ground color semihyaline to yellowish white marked with orange or red. Vertex with semblance of three white spots more or less surrounded with orange bands. Median white spot elongated. Pronotum with median Y-shaped orange mark, touching both margins, usual angular mark behind each eye. Scutellum with spot on tip, basal angles yellow. Clavi with basal anchor-shaped mark and rectangular spot before tip. Coria with angulate vitta arising on costa midway between plaque and humeral angle, reaching to claval suture. Another irregular-sided, zigzag, vitta arising at anterior end of plaque, more or less surrounding it and ending just before base of cell M_4. Black spot in posterior end of plaque and base of cell M_4. Tips of tegmina more or less dusky. Cross-veins red. Venter stramineous.

Genitalia. Pygofer hook single, parallel-sided and evenly rounded for basal two-thirds where it widens rapidly for short distance then narrows sharply into a claw-like tip. Style with medium foot; base straight; almost no heel; anterior point short, less than right angle; posterior point shorter, more than right angle. Oedagus of medium size, slightly bent in lateral view, tip rounded covered with low ridges on outer two-thirds.

Holotype; male, Natchitoche Parish, La., 8-16-28, R. H. Beamer.

Allotype; female, same data.

Paratypes; two males; same data; one each from Caddo Parish, La., Bowie Co., Tex., and Harris Co., Texas.

This species is characterized by the style having foot without points and the peculiar tip to the pygofer hook.

52. **Erythroneura parva** n. sp.

General ground color semihyaline to yellowish white, marked with orange. Vertex with median white spot surrounded with rather heavy orange band, this is often broken up into spots. Pronotum with median longitudinal vitta usually not quite touching either margin, often bifid anteriorly, usual angular spot back of each eye. Clavi with usual anchor-shaped basal spot and rectangular mark before tip. Coria with spot on costa midway between costal plaque and humeral angle, another vitta more or less broken and irregular-sided arising on costa at anterior end of plaque, more or less surrounding it and ending before base of cell M_4. Cross-veins more or less red or orange. Small black spot in posterior end of plaque and in base of cell M_4. Tips of tegmina more or less dusky. Venter stramineous.

Genitalia. Pygofer hook single, very short, tapering from base to very narrow outer half, with slight S-curve. Style with large foot; base almost straight; heel large; anterior point very short about a right angle; posterior point as long as foot, narrow, slightly curved in, almost parallel sided. Oedagus short, slightly curved dorsally in ventral view.

Holotype; male, Natchitoche Parish, La., 8-16-30, R. H. Beamer.

Allotype; female, Lacoochee, Fla., 8-18-30, R. H. Beamer.

Paratypes; 4 males, Natchitoche Parish, La.; 1 male, Caddo Parish, La.; 12 males, Lacoochee, Fla.; 1 male, Hilliard, Fla.; 1 male, Plummer's Id., Md.

This species is easily separated from all others by the inner male genitalia. The very small pygofer hook is quite characteristic. The specimens were swept from oak.

53. **Erythroneura facota** n. sp.

General ground color yellowish white to semihyaline, markings red or orange, lighter in summer specimens. Vertex with semblance of three red spots surrounded with red bands. Pronotum with rather small V-shaped spot on disc. Usual angular mark back of each eye. Scutellum with tip, even with outer ends of basal angles red, basal angles yellow with outer margins red and a semblance, in some specimens, of a red border on inner median edge. Clavi with usual basal red anchor-shaped mark and rectangular spot before tip. Coria with spot on costal margin midway between costal plaque and humeral angle, another at base of plaque, quadrangular spot opposite plaque and almost touching claval suture and three dashes on longitudinal veins beginning at posterior end of plaque and progressing slightly toward tip, inner spot or dash larger. Cross-veins red. Small black spot in base of cell M_4 and very small one in posterior end of costal plaque. Tips of tegmina more or less dusky. Venter stramineous more or less tinged with pink.

Genitalia. Pygofer hook single, of medium length, forked at tip into two equal parts, divergence slightly less than right angle. Style with medium foot; base slightly curved; heel medium; anterior point, short, blunt, about a

right angle; posterior point narrow, about as long as width of toe. Oedagus of medium length, almost straight, cylindrical.

Holotype; male, Lacoochee, Fla., 8-18-30, R. H. Beamer.

Allotype; female, and ten male paratypes, same data.

This species was collected from oak in Florida. It may be separated from all others by the internal genital characters.

54. **Erythroneura consueta** n. sp.

General ground color semihyaline to yellowish white marked with red. Vertex with a semblance of usual three white spots more or less surrounded with red bands. Pronotum with median, small red spot, in some cases with semblance of connections at each anterior corner with anterior margin, usual angular spot back of each eye. Scutellum with small spot at tip, basal angles yellow with narrow dash of red on lateral margins. Clavi with usual basal anchor-shaped spot and rectangular one just before tip. Coria with spot on costa before humeral angle, angular dash at anterior margin of costal plaque (in type these two spots are united), rectangular spot opposite middle of plaque and open spot in clavus, three stripes at posterior end of plaque, second on M_1 and third on Cu from even with posterior end to plaque to cross-veins. Tips of tegmina dusky. Cross-veins red. Small black spot in base of cell M_4 but lacking one in posterior end of costal plaque. Venter stramineous tinged with pink. Face with V-shaped cross band.

Genitalia. Pygofer hook single, widest at base, bifid on about outer half, inner fork may curve evenly in on outer half. Style with medium foot; base curved; heel large; anterior point about a right angle, very short; posterior point as long as or longer than foot, narrow, tapering to tip which turns slightly out. Oedagus very short, about as broad as long, thickly set with spines, somewhat triangular-shaped in dorsal view.

Holotype; male, Anderson Co., Kansas. Nov. 26, 1927, R. H. Beamer.

Allotype; female, Washington, D.C., Zoological Park.

Paratypes; 14 males, Washington, D.C.; 2 males, Plummer's Id., Md.; 7 males, Marshall, Ark.; 2, Plummer's Id., Md.

The bent inner fork of the pygofer hook and the lack of a black spot in the posterior margin of the costal plaque will usually separate this species from all others.

55. **Erythroneura zioni** n. sp.

General ground color semihyaline to yellowish white marked with red. Vertex with three red dashes more or less surrounding a median oval yellowish white spot. Pronotum with median heart or triangular shaped red spot, not touching either margin, and usual angular spot back of each eye. Scutellum with tip red, basal angles yellow surrounded on two sides with band of red. Clavi with heavy basal anchor-shaped spot and rather long more or less rectangular spot just before tip, sometimes narrowly connected with basal spot. Coria with red angular spot at base, red irregular-sided zigzag vitta arising on costa at anterior end of plaque, touching claval suture before and again after outer spot of clavus, ending in cross-veins at base of cell M_2. Tips of tegmen more or less dusky. Black spot in base of cell M_4 and much smaller one in posterior end of costal plaque.

Genitalia. Pygofer hook single, almost parallel-sided, slightly curved in, of medium length. Style with medium foot; base curved; heel small; anterior point short, less than a right angle, projecting slightly outward; posterior point shorter, about a right angle. Oedagus of medium length, in lateral view slightly tapering from base to tip and slightly bent dorsally, covered with low ridges.

Holotype; male, Zion National Park, Utah, August 13, 1929, R. H. Beamer.

Allotype and 10 male paratypes, same data.

The specimens were collected from oak.

56. **Erythroneura nevadensis** n. sp.

General ground color semihyaline to yellowish white marked with orange. Vertex with semblance of five white spots more or less surrounded with orange bands, median spot quite narrow and elongated. Pronotum with median longitudinal stripe, almost parallel-sided, forked anteriorly enclosing a small more or less rectangular white spot, usual angular mark back of each eye extending more than half way to posterior margin. Scutellum with tip black, basal angles brownish margined with orange in some specimens. Clavi with usual basal anchor-shaped mark and spot near tip. Coria with spot on costa slightly nearer base than plaque, an irregular sided zigzag vitta arising on costa at anterior end of plaque, almost surrounding it and ending before base of cell M_4. Cross-veins more or less red. Black spot in base of cell M_4 and one as large or larger in posterior end of plaque. Tips of tegmen more or less dusky. Abdomen dark throughout giving rather a dusky appearance to the insect when viewed dorsally.

Genitalia. Pygofer hook single, almost straight, basal third much heavier twice as wide as outer part. Style with medium foot; base slightly curved; heel large; anterior point short about a right angle; posterior point third longer than width of toe, narrow, sharp pointed, extending at right angle to base. Oedagus large and broad from dorsal view; base broad with roughened edge; two broad, dorsally curving, plate-like processes on ventral side of shaft extending almost to tip; shaft proper short, lateral edges with teeth, ends in a dorsally curving lip.

Holotype; male, Carson City, Nevada, August 9, 1929, R. H. Beamer.

Allotype; female, and 5 male and 13 female paratypes, same data.

(to be continued)

A SYNONYMIC NOTE (COLEOP.)

BY RALPH HOPPING,
Vernon, B.C.

Anoplodera planata S. & H.

Anoplodera planata S. & H. 1928, Bull. 52, Can. Nat. Mus. 62.

This species was described several years ago (The Lepturini of America North of Mexico Pt. I, p. 62) from specimens labeled "Iowa". Since then the authors have been able to examine a large collection of *Lepturini* from Europe and find that *planata* S. & W. is conspecific with *Leptura rubra* L. which belongs to the genus *Anoplodera.* It is possible that this species has been introduced and is now breeding in Iowa.

MAILED THURSDAY, MARCH 24TH, 1932.

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